REMARKS/ARGUMENT

This amendment is in response to the office action of June 20, 2002, in accordance with 37 C.F.R. § 1.111.

Claims 8 through 23 are pending in the application. Claims 9, 22, and 23 are amended by this response.

The applicants thank the Examiner for conducting a telephone interview with the applicants' attorney on September 11, 2002.

1. Objections to the Drawings under 37 C.F.R. §1.83(a)

The Examiner objects to the drawings under 37 C.F.R. §1.83(a), stating that the drawings fail to show every feature of the invention specified in the claims. The Examiner states that the recitations of claims 9 and 12 must be shown in the drawings. The applicants traverse this objection and request reconsideration.

The Examiner states that "the cylindrical base member with a wall thickness greater than the wall thickness greater than the wall thickness of the support member as disclosed in claim 12" is not shown. The applicants refer the Examiner to element 2 of Figure 1 where the cylindrical base member is shown. The cylindrical base 2, as shown in the figure, has a wall thickness that is greater than the wall thickness of the support member 4. This objection should be withdrawn.

The Examiner also argues that "the vibration node as disclosed in claim 9" is not shown. Claim 9 recites that "the circular path defines a vibration node of the vibration plate." A vibration node is a location where the vibration is essentially zero amplitude. The applicants refer the Examiner to element 4 of Figure 1B where the vibration node is shown. The vibration plate 2' has an inner region and an outer region as shown in Figure 1A. It is because the plate is supported and clamped to the support member 4 along the circular path as shown in Figure 1C, that the vibration plate has a vibration node along the point of contact of the support member 4 with the vibration plate. Thus, there is a vibration node or the amplitude of the vibration, along the circular path defined by the support member 4, is essentially zero at this point. (See the specification on page 8 at line 18.) This objection should be withdrawn.

2. Rejection of Claims 9 and 23 under 35 U.S.C. § 112, Second Paragraph

The Examiner rejects claims 9 and 23 under 35 U.S.C. §112, second paragraph, stating that the claims are indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. The applicants traverse this rejection and requst reconsideration.

The Examiner rejects claim 9 and asks "how the circular path defines a vibration node?" As discussed above, the amplitude of vibration is essentially zero at the node defined by the support member 4. The applicants amend claim 9 to recite that "the circular path defines an amplitude vibration node of the vibration plate" for clarity. This rejection should be withdrawn.

The Examiner rejects claim 23 and asks "is the vibrator design to only vibrate in the outer region?" The vibration plate vibrates both in the inner and outer regions as shown in Figure 1. Claim 23 recites that "a piezoelectric element is coupled to a central region of said disc-like vibration plate to cause said inner and outer regions to vibrate in substantially the same phase." Accordingly, the inner and outer regions do vibrate. Claim 23 also recites that "the vibration plate is free to vibrate in the outer region." This recitation was meant to emphasize that the vibration plate in the outer region is free to vibrate, unlike the prior art Yamamoto et al. reference wherein the vibration plate is clamped in the outer region between the member 2 and the member 3b at the point 3c as shown in Figure 1. Accordingly, the Yamamoto reference does not have an outer region where the disc is free to vibrate. The applicants amend claim 23 to recite that "the vibration plate is free from support in the outer region" for clarity. This is in contrast to Yamamoto reference wherein the vibration plate is fixed in the outer region and thus cannot vibrate in the outer region. However, the Examiner should understand that in the present invention, as claimed, the vibration plate vibrates in both the inner and outer regions. This rejection should be withdrawn.

3. Rejection of Claims 8 through 13, 17 through 19, 22, and 23 under 35 U.S.C. §103(a)

The Examiner rejects claims 8 through 13, 17 through 19, 22, and 23 under 35 U.S.C. §103(a), stating that the claims are unpatentable over U.S. Patent Number 5,955,821 to Yamamoto et al. in view of U.S. Patent Number 5,659,220 to Thurn et al.

and U.S. Patent Number 5,983,471 to Osawa. The applicants traverse this rejection and request reconsideration.

The Examiner states that "[i]t was also mentioned during the interview that the outer regions disclosed in claim 8 may need a more concise structural description so the claim is well established to be different from the prior art" on page 1 of the September 11, 2002, interview summary. The applicants believe that the structure recited in claim 8 is clearly distinguished over the prior art for the reasons discussed below. The applicants annotate claim 8 with reference to the corresponding structural elements illustrated in the figures as follows. The annotation is provided as a visual aid for the Examiner and is in no way intended to limit claim 8.

> 8. An ultrasonic vibration apparatus, comprising:
> a disk like vibration plate (element 2' of Figures 1A through 1C) having a circular vibration surface (element 2' of Figure 1C), said vibration surface has an outer periphery (outer edge of element 2' of Figure 1C);
> a support member (element 4 of Figures 1A through 1C) coupled to said disk like vibration plate along a circular path (element 4 of Figure 1C) located inside said outer periphery of said circular vibration surface (element 4 is located inside of the outer edge of element 2' in Figure 1C) so as to divide said vibration surface into inner (INNER REGION of Figures 1A and 1C) and outer (OUTER REGION of Figures 1A and 1C) regions;
> and a piezoelectric element (element 1 of Figures 1A and 1B) coupled to a central region of said disk-like vibration plate (center region of element 2' of Figures 1A and 1B) to cause said inner and outer regions to vibrate (vibrations of Figure 1B) in substantially the same phase.

The Examiner relies upon the Yamamoto et al. patent stating that it discloses "a hollow cylindrical support member 3." (See the June 20, 2002, office action on page 3 at line 16.) The hollow cylindrical support member 3 of the Yamamoto et al. patent, however, fails to "to divide said vibration surface into inner and outer regions" as required by claim 8. The Yamamoto et al. patent teaches away from the claimed invention because "the piezoelectric diaphragm 4 is partially supported at selected points [5a] along its outer periphery." (See the Yamamoto et al. patent in column 5 at lines 65

through 67 and Figure 2.) The cylindrical support member 3 is not "coupled to the disc-like vibration plate along the circular path located inside the outer periphery of the circular vibration surface" as required by claim 8. The Yamamoto et al. patent precludes a division of the piezoelectric diaphragm 4 into the inner and outer regions recited in claim 8 because "the piezoelectric diaphragm 4 is sandwiched [or clamped] between the ring-like support planes 2c, 3c shown in FIG. 1 at specific portions where the plural projections 5a are provided." (See id. in column 5 at lines 60 through 65.) This clamping at the outer periphery prevents a creation of the claimed outer region and prevents vibration of the plural projections 5a as required by claim 8. Without providing a motivation to created an outer region, the Yamamoto et al. patent cannot and does not disclose or suggest a piezoelectric element that causes "said inner and outer regions to vibrate in substantially the same phase" as required by claim 8.

Similarly, with respect to claims 22 and 23, these claims recite that the inner and outer region, which are defined by the circular support member, vibrate in substantially the same phase. The Yamamoto et al. device does not have inner and outer regions which are defined by the support member which vibrate in substantially the same phase. It cannot have such regions because of its construction whereby the vibration plate is held in place between the casing 2 and the support member 3b. Accordingly, even when combined with the Thurn et al. patent and the Osawa patent, the claimed invention is not disclosed.

The Thurn et al. patent discloses an ultrasonic transducer having a disc-shaped matching element 2 with a circumferential notch of depth 5. The Thurn et al. patent fails to disclose or suggest a vibrating plate having inner and outer regions defined by a support member and both of which regions are free to vibrate. Accordingly, even when combined with the Yamamoto et al. patent the invention is not taught or suggested.

The Osawa patent discloses an ink jet head and shows, in Fig. 5, a vibrating plate supported by a support member 110 and a base member 121. However, the Osawa patent fails to disclose or suggest a disc-like vibration plate having outer and inner regions defined by a support member and whereby the outer and inner regions vibrate in substantially the same phase. The Osawa patent shows a rectangular vibration plate 115 supported on a support plate 110 and base member 121 but fails to disclose or suggest

anything remotely resembling the ultrasonic vibration apparatus according to the present invention.

The Examiner's citations do not make obvious the claimed subject matter as a whole. This rejection should be withdrawn.

4. Conclusion

The application is believed to be in condition for allowance. Favorable consideration is requested.

Respectfully submitted,

Paul Dujmich Reg. No. 30,754

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Louis C. Dujmich
Registration No. 30,625
OSTROLENK, FABER, GERB & SOFFEN, LLP
1180 Avenue of the Americas
New York, New York 10036-8403
Telephone: (212) 382-0700